UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,467	04/02/2004	Christopher F. Lyons	H0368	3192

23623 7590 03/31/2009

AMIN, TUROCY & CALVIN, LLP
127 Public Square
57th Floor, Key Tower
CLEVELAND, OH 44114

EXAMINER	
LEWIS, MONICA	

ART UNIT	PAPER NUMBER
2894	

NOTIFICATION DATE	DELIVERY MODE
03/31/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket1@thepatentattorneys.com
hholmes@thepatentattorneys.com
lpasterchek@thepatentattorneys.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHRISTOPHER F. LYONS

Appeal 2009-1064
Application 10/817,467
Technology Center 2800

Decided:[1] March 27, 2009

Before JOSEPH F. RUGGIERO, JOHN A. JEFFERY, and
MARC S. HOFF, *Administrative Patent Judges*.

JEFFERY, *Administrative Patent Judge*.

DECISION ON APPEAL

---

[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

Appellant appeals under 35 U.S.C. § 134 from the Examiner's rejection of claims 1-9. Claims 10-20 have been withdrawn from consideration (Br. 2). We have jurisdiction under 35 U.S.C. § 6(b). We reverse.

STATEMENT OF THE CASE

Appellant invented integrated circuits with polymer dielectrics as memory element interconnects in organic memory devices. Specifically, the thermal expansion coefficients[2] of the polymer dielectric and the organic semiconductor material are substantially matched to mitigate the undesirable effects of temperature changes.[3] Claim 1 is illustrative with the key disputed limitation emphasized:

1. A semiconductor device, comprising:

a substrate;

a polymer dielectric over the substrate; and

at least one active device comprising an organic semiconductor material and a passive layer,

wherein *coefficients of thermal expansion of the polymer dielectric and organic semiconductor material are substantially matched.*

The Examiner relies on the following prior art reference to show unpatentability:

Lyons	US 6,955,939 B1	Oct. 18, 2005 (filed Nov. 3, 2003)

[2] A thermal expansion coefficient "is generally defined as the fractional increase in length per unit rise in temperature." (Spec. 4:28-29.)
[3] *See generally* Spec. 1:5-7; 3:21-24; Abstract.

The Examiner rejected claims 1-9 under 35 U.S.C. § 102(e) as anticipated by Lyons (Ans. 4-5).

Rather than repeat the arguments of Appellant or the Examiner, we refer to the Brief and the Answer[4] for their respective details. In this decision, we have considered only those arguments actually made by Appellant. Arguments which Appellant could have made but did not make in the Brief have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Regarding independent claim 1, the Examiner takes the position that Lyons discloses all of the claimed subject matter. In reaching this conclusion, the Examiner concedes that Lyons does not expressly disclose the last limitation calling for substantially matching the thermal expansion coefficients of the polymer dielectric and organic semiconductor material. Nevertheless, the Examiner contends that the materials in Lyons corresponding to the recited polymer dielectric and organic semiconductor materials—namely polyimides and polyacetylene, respectively—would inherently have substantially-matched thermal expansion coefficients since they are the same materials used in Appellant's invention. (Ans. 4, 7.)

Appellant, however, challenges the Examiner's assertion of inherency—an assertion that Appellant argues is unsupported factually in Lyons. According to Appellant, Lyons is silent regarding the thermal expansion coefficients of the identified materials. According to Appellant, merely alleging that a thermal expansion coefficient of a certain dielectric

[4] Throughout this opinion, we refer to the amended Appeal Brief filed May 25, 2007 and the Examiner's Answer mailed Sept. 4, 2007.

material among numerous dielectric materials may match that of a certain material among numerous organic polymers is insufficient to establish inherency. (Br. 4-5.)

The issue before us, then, is as follows:

ISSUE

Has Appellant shown that the Examiner erred in finding that the materials that the Examiner identifies as corresponding to Lyons' polymer dielectric and organic semiconductor materials—namely polyimides and polyacetylene, respectively—would inherently have substantially-matched thermal expansion coefficients in rejecting claim 1 under § 102?

FINDINGS OF FACT

The record supports the following findings of fact (FF) by a preponderance of the evidence:

Lyons

1. Lyons discloses organic memory device 100 with plural organic memory cells 104. Each organic memory cell has electrodes 106 and 108 and a controllably conductive media 110 therebetween. The controllably conductive media contains an organic semiconductor layer 112. (Lyons, col. 3, l. 54 – col. 4, l. 4; Fig. 1.)

2. A photosensitive dielectric is deposited on the substrate and comprises, among other things, polyimides. (Lyons, col. 4, ll. 5-40.)

3. In one embodiment, an organic semiconductor layer 212 is formed over a substrate 200. (Lyons, col. 11, l. 57 – col. 12, l. 2; Figs. 4, 5.)

4. The organic semiconductor layer contains an organic semiconductor material selected from at least one of an organic polymer (e.g., a conjugated organic polymer), an organometallic polymer, a buckyball, a carbon nanotube, and the like. (Lyons, col. 12, l. 64 – col. 13, l. 2.)

5. An example of a conjugated organic polymer is polyacetylene. (Lyons, col. 13, ll. 49-52.)

Appellant's Disclosure

6. "The coefficient of thermal expansion is generally defined as the fractional increase in length per unit rise in temperature." (Spec. 4:28-29.)

7. "General examples of polymer dielectrics include low k[5] polymers and low k fluoropolymers. Examples of polymer dielectric include polyimides . . . ." (Spec. 5:27-28.) *See also* claim 2 of the present application (listing polyimides as one of the materials for the recited polymer dielectric).

8. "Organic semiconductors generally include polymers with variable electric conductivity. . . includ[ing] polyacetylene. . . ." (Spec. 9:25-30.) *See also* claim 7 of the present application (listing polyacetylene as one of the materials for the recited organic semiconductor material).

9. "[T]he polymer dielectrics and organic memory devices have relatively matched coefficients of thermal expansion since both are organic based materials." (Spec. 14:24-26.)

---

[5] According to Appellant's Specification, "low k" materials have a low dielectric constant and "provide electrical insulation between various layers, devices, structures, and regions within semiconductor substrates." (Spec. 5:14-17.)

PRINCIPLES OF LAW

Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. *RCA Corp. v. Appl. Dig. Data Sys., Inc.*, 730 F.2d 1440, 1444 (Fed. Cir. 1984); *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1554 (Fed. Cir. 1983).

Under the doctrine of inherency, if a claimed element is not expressly disclosed in a prior art reference, the reference nevertheless anticipates the claim if the missing element is necessarily present in the reference, and it would be so recognized by skilled artisans. *Rosco, Inc. v. Mirror Lite Co.*, 304 F.3d 1373, 1380 (Fed. Cir. 2002) (citations and internal quotation marks omitted). To anticipate the claim, the missing element must be *necessarily present* in the prior art—not merely probably or possibly present. *Id.*

ANALYSIS

This appeal hinges on one crucial question: whether the materials that the Examiner identifies as corresponding to the polymer dielectric and organic semiconductor material—namely polyimides and polyacetylene, respectively (Ans. 7)—*necessarily* have thermal expansion coefficients that are substantially matched. Based on the record before us, however, we cannot say that this is the case.

It is undisputed that Lyons discloses all of the recited structural elements of claim 1 except for the last limitation. *See* FF 1-3; *see also* Br. 4-5. And Lyons teaches using similar materials for the dielectric (polyimides)

(FF 2) and the organic semiconductor material (polyacetylene) (FF 4-5) as those used in the present invention. *Compare* FF 2, 4, and 5 *with* FF 7 and 8.

But this similarity is insufficient to establish anticipation by inherency—a position that requires that the missing element be necessarily present in the reference (i.e., that the thermal expansion coefficients are necessarily substantially matched). *See Rosco*, 304 F.3d at 1380. Although polyimides are used for the dielectric in the claimed invention and Lyons, the Examiner has no provided no evidence on this record proving that the *particular type of polyimide* used for the dielectric in Lyons (FF 2) (or any other of the disclosed materials for the polymer dielectric) would necessarily have a coefficient of thermal expansion substantially matching that of the disclosed materials for the organic semiconductor material (FF 4-5).

Polyimides constitute a genus of materials with species that can have different thermal expansion coefficients.[6] Even assuming, without deciding, that one of these polyimide thermal expansion coefficients (e.g., the higher value) matches that of the polyacetylene organic semiconductor material (a finding that the Examiner did not support with evidence in any event), we cannot say that that particular polyimide is necessarily used in Lyons. It is equally possible that another polyimide was used with a different thermal expansion coefficient (e.g., a low thermal expansion coefficient).

---

[6] *See, e.g.*, Shun'ichi Numata et al., *Thermal Expansion Behavior of Various Aromatic Polyimides*, 31 J. OF APPL. POLYMER SCI. 101, Abstract (1986), *available at* http://www3.interscience.wiley.com/journal/104027826/abstract (last visited Mar. 24, 2009) (distinguishing polyimides with high thermal expansion coefficients (3-6 × 10^{-5} K^{-1}) from other polyimides with very low thermal expansion coefficients below 1 × 10^{-5} K^{-1}).

Furthermore, even if it is probable that one type of polyimide was used in Lyons over another, such probabilities are insufficient for anticipation. Rather, to successfully rebut Appellant's challenge to the Examiner's inherency assertions, the Examiner must prove with supporting evidence that the materials relied upon in Lyons *necessarily* have thermal expansion coefficients that substantially match. The record before us is simply devoid of the requisite evidence in this regard.

For the foregoing reasons, Appellant has persuaded us of error in the Examiner's anticipation rejection of independent claim 1. Therefore, we will not sustain the Examiner's rejection of that claim, and claims 2-9 for similar reasons.

CONCLUSION

Appellant has shown that the Examiner erred in rejecting claims 1-9 under § 102.

ORDER

The Examiner's decision rejecting claims 1-9 is reversed.

REVERSED

babc

AMIN, TUROCY & CALVIN, LLP
127 Public Square
57th Floor, Key Tower
CLEVELAND OH 44114